

## **The Australian Native Foods Industry: New Challenges for the Plant Propagator**

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### **INTRODUCTION**

There is already a broad range of foods currently available which are legitimately native to Australia. In addition to well known edible fauna, we have a diverse range of native food-producing flora capable of being commercialised in a short period of time. Species selection has been strongly influenced by culinary successes from restaurants specialising in Australian native cuisine.

Further development of such an industry will offer a commercially viable supplement to marginal agricultural enterprises, irrigated and dryland. Additionally, in the short-term, it has the potential to offer Landcare groups, aboriginal communities, farmers, bush regenerators, and local councils economic returns on revegetation programs and financial incentives to preserve wild populations.

Our neglect of native foods is a legacy of foreign traditions that has seen land use ethics evolve which have failed to adopt and adapt to indigenous land ethics. It has been naive of us to assume that we can maintain Australia's natural ecosystems whilst continuing to survive on exotic plant and animal species and largely ignoring the biodiversity of our country.

Indeed, our present farming systems have a dangerous dependence on just a few crops with 66% of our foods coming from just three plants (Washington, 1991), yet Aboriginal people have used between 4000 to 5000 plants for food (Cherikoff and Isaacs, 1988).

We now have the opportunity to evolve a land ethic based on biodiversity not eco-simplicity, through combining Aboriginal knowledge and land management techniques with contemporary technologies, farm management systems, and agro-ecologies.

From the broader industry perspective there is already a small but growing native food industry. Two nationally coordinated wild food collection and distribution networks exist with bases in Adelaide and Sydney. Specialty restaurants are thriving in South Australia, Victoria, New South Wales, Western Australia, and the Northern Territory. And there are a number of small-scale food processing activities up and running.

A national workshop on the native food industry was held in Sydney in February 1995. It was convened by the Commonwealth Department of Primary Industries and Energy and demonstrates that there is now a national agenda, and a commitment by Government, to accelerating the development of the industry.

In late 1992, Australian Native Produce Industries Pty Ltd (ANPI) was formed and is playing a pioneering role in the development of the industry. The company is fully integrated in that it is propagating, cultivating, collecting from the wild, processing and marketing a broad range of Australian native foods.

Currently, a combination of western culinary expertise and indigenous knowledge is stimulating a great deal of interest in ANPI's work and Aboriginal culture throughout Australia and overseas, shaking off the more sensational images of "Bush Tucker" and developing a truly Australian cuisine.

Until recently, harvesting from the wild has been the principal source of raw produce supply. But as interest and demand has grown, harvest pressure on the wild is now at an unacceptably high level. Unfortunately, some of these resources are now particularly rare. For example, *Diplogottis campbellii* (small-leaved tamarind) has been reduced to just 12 remaining in-situ individuals. Some species with restricted distributions and particularly tasty fruits are in high demand. *Kunzea pomifera* (muntries) occurs in southeast South Australia and southwest Victoria and has excellent potential as a fresh berry crop, condiment, or fruit-bread ingredient. In the 1994 season, a number of tonnes of these fruits were harvested.

It is imperative that measures to control exploitation of wild resources are implemented (i.e., better natural forest and land use management with supplements for natural production through cultivation) as is now happening through the efforts of ANPI.

In rising to meet these needs ANPI has:

- Developed a commercial plant production nursery which is propagating superior genetic lines for its own plantations and for sale to other growers and the home garden market.
- Commenced development of a "model farm" near Renmark for production, research and demonstration purposes (irrigated and dryland systems).
- Established an export standard processing facility in Adelaide which produces the "Red Ochre" range of gourmet products for the retail and food service sectors.

The current tensions between supply and demand are reflected in the high prices being paid for some native produce, and also their volatility. To date, where cultivation of a particular crop has commenced, there has not been an appreciable drop in prices paid.

A graphic example of the current price situation is that of quandongs (*Santalum acuminatum*). In 1989, a wholesale buyer would have expected to pay between \$20.00 to \$30.00 per kg for first grade, halved and dried product. In the 1993 season competition was fierce for fruit of all grades. Buyers entered the market in the vicinity of \$50.00 per kg for first grade. The price rapidly rose to above \$60.00 per kg.

ANPI entered the market with the intention of buying several tonnes of product, but was unable to source anywhere near this quantity at a price it was prepared to pay. On this basis the company withdrew from the market and the prospect of producing processed quandong products for the retail market was put on hold.

To reduce the adverse impacts of harvest pressure, and to provide a "reliable source of high quality raw produce", there is a need to cultivate a range of native food plants. The company has committed a great deal of effort to sourcing the best genetic material from the wild, botanic gardens, the CSIRO, and native plant enthusiasts. The next challenge has been, and continues to be, to develop commercially viable methods of propagation for a number of difficult-to-propagate species.

## MATERIALS AND METHODS

ANPI's research work spans a broad range of species from many different ecological niches throughout Australia. Some of the genera are fairly new to cultivation, and certainly to commercial food production (e.g., *Dioscorea* and other yams). Criteria for selecting superior genotypes include such attributes as crop yield, food value, oil contents, disease resistance, and fruit flavour, size, colour, shape, and texture.

For many species, our methods of propagation have been previously untried (e.g., budding, grafting, and hybridisation). Cutting and seed preparations vary considerably in our endeavours to achieve high degrees of success for a wide range of species. Propagation protocols developed range from straightforward to quite complex. For example, quandong seeds (*S. acuminatum*), go through a lengthy but effective process based on research findings of the CSIRO Division of Horticulture.

Different combinations of auxin treatments are utilised using IAA, IBA, GA, and NAA solutions with 1- to 10-sec dips for cuttings. Punnets or Kwik Pot trays are used with mixtures of sand and peat/coco peat (7 : 3, v/v) or perlite and compost (5 : 1, v/v). For seed, the mixtures are either vermiculite or sand and peat/coco peat (7 : 3, v/v). Trays are then placed on a propagation bench with bottom heat in a polyhouse with a low-pressure water and compressed-air fogging system, and hand watered periodically throughout the day (seeds require far less water than cutting materials and so are separated).

Emphasis is placed on the selection of high quality propagules (i.e., fresh seed, actively growing cutting materials). Therefore access to mother stock collections is essential for commercially acceptable results. In our dry climate at Renmark in South Australia, the use of modern facilities such as fog (Envirocare, Melbourne) provides the propagator with a significant advantage.

Despite close attention to hygiene, *Pythium* infections have been a recurring problem in some species prone to this fungal pathogen. As a result we are actively involved in research into non-chemical treatments. Currently we are conducting trials into beneficial fungal soil inoculants, namely *Trichoderma koningii* and *T. harzianum*, as we are committed to pursuing organic production systems wherever practicable.

## RESULTS

Some examples of our results are included in the following species.

### ***Backhousia citriodora* (Lemon Myrtle).**

**Description.** Evergreen, upright and spreading tree 10 to 15 m. Dense canopy of dull green foliage (rounded leaves to 100 mm) has a strong lemon scent. Profusion of white to light-green flowers in summer. Occurs naturally in sub-tropical and tropical rainforest areas of Queensland receiving greater than 800 mm of rainfall, on rich organic, sandy, or heavy textured soils.

**Culinary Uses.** The strongly lemon-flavoured leaves may be picked at any time of the year, and are becoming highly sought after by the restaurant and gourmet industries. Fresh and dried leaves are used to flavour, seafood, salads, savoury sauces, hot and cold beverages, deserts, and ice creams.

**Propagation and Cultivation.** Production from seed is reliable, given fresh viable seed. However, for clonal production it is essential to source superior quality selections. Early attempts to mass propagate by cuttings sourced from wild

specimens yielded poor results. Since establishing nursery stock plants with vigorous new growth, rooting can be consistently achieved within 3 to 4 weeks.

***Acronychia oblongifolia* (Southern Lemon Aspen).**

**Description.** An erect glabrous tree 5 to 10 m, usually in rainforest gullies from the Mitchell River in Victoria, southeast Australia, to Gympie in southern Queensland.

**Culinary Uses.** The fruit of the lemon aspen is a small, pale-coloured fruit to 13 mm with a unique sharp citrus flavour. The fruit has the versatility of a lemon. Whole lemon aspen fruit (or juice) can be used in pastries, desserts, sauces, dressings, jams, and marinades. The pulp from juicing can flavour shortbread, or be infused to extract its unique flavour.

**Propagation and Cultivation.** Many propagators have had disappointing results when germinating seed of this genus, with this species recording only “5% germination after 175 days” (Floyd, 1989). Our experience has shown that this species may be germinated reliably if fresh seed is removed from the flesh of the fruit. Rooting of cuttings has proven to be very slow and of poor success. Methods for budding and grafting of vigorous seedlings are being investigated. Early indications are that these methods of clonal propagation will be successful.

***Tasmania lanceolata* (Mountain Pepper).**

**Description.** A shrub or small tree normally 3 to 7 m but can reach 10 m. Found chiefly in tall forests on cool moist slopes and in gullies, the lower mountain to sub-alps.

**Culinary Uses.** Both the pepperleaf and the pepperberries can be used fresh, dry or ground and added to dishes as a seasoning. The hot and spicy leaves, with a flavour between pepper and chilli, can be used whole like bay leaves and develop a subtle flavour when cooked. Ground pepperleaf is used as a seasoning on soups or mains just before serving. The small purple/black berries are hot and peppery and can flavour or garnish almost any sauce, can be baked into bread, or can be used to enhance the flavour of meats and even the traditional pepper steak.

**Propagation and Cultivation.** The active “hot factor” has been identified as polygodial. The commercial future for this compound includes medicinal uses as well as its culinary potential. Genotype selections are necessary to ensure high levels of polygodial. Due to the need to propagate clonally, we have little experience in germinating this species from seed. Cuttings from vigorous nursery stock plants root in 2 months and yield a success rate up to 80%.

***Podocarpus elatus* (Illawarra Plum)**

**Description.** An evergreen tree of variable height (5 to 35 m), though smaller in cultivation. Foliage is dark glossy green, new growth is an attractive lime-green. Blue-black plum-like fruits to 3 cm are carried on female trees, with the large seed borne distally on the outside of the fruiting body. The tree occurs naturally in temperate to sub-tropical areas of eastern NSW and Queensland, on a broad range of soils.

**Culinary Uses.** The fruit ripens in autumn to winter and has a subtle plum/pine flavour, and may be used for both sweet and savoury applications (e.g., plum and chilli sauces, chutneys, jams, pies, desserts, etc).

**Propagation and Cultivation.** Seed germinates readily, but due to this species' dioecious nature, yields male and female individuals. Cutting propagation has proven to be most successful when cuttings are set in January-February. Cuttings are slow to root (approx. 3 months), and experience slow initial growth when potted. Budding and grafting methods are being experimented with, but it is too early to report the results at this stage. Amenity trees growing in suburban Adelaide have provided 4 years of fruiting information regarding early, mid, and late season cropping, different sweetness, size, bienniality, skin texture, etc.

### **Acacia Species (Wattles).**

**Description.** *Acacia* species are another plant group which merit serious consideration for commercial food production. As many as 50 species of *Acacia* are known to have been consumed by Aborigines on an Australia-wide basis (Cherikoff and Isaacs, 1989). On average, *Acacia* seeds are about 23% protein; 26% carbohydrate; 32% fibre, and 9% fat (Brand and Maggiore, 1992). While some research has been carried out relating to human nutrition, the culinary benefits of the different species are becoming quite apparent. Wattleseed, aside from being extremely nutritious, provides a wealth of unique flavours and is proving to be extremely versatile (after roasting) in the kitchen.

The oil extracts of some of the acacias are highly palatable and commercial exploitation is feasible because the seed oil content is high. The unsaturated nature of *Acacia* oils means that they are desirable from a health point of view, but as they are readily oxidised they may present problems in food processing and storage.

ANPI is currently propagating a number of targeted species by seed, but clonal methods will soon be important as selections are made on the bases of flavour, culinary suitability, seed size, crop quantity, and ease of harvesting.

**Culinary Uses.** The seeds of acacias are roasted and ground to produce a coffee-chocolate-hazelnut flavour. The "flour" is used to make wattleseed ice cream, pavlova, pancakes, wattleccinos, or mixed (approximately 10%) with other flours to make dampers and breads.

## **DISCUSSION**

To date, successes have been achieved with species previously considered difficult both from sexual (*Acronychia oblongifolia*, *Solanum centrale*, *Leptomeria acida*) and asexual (*Santalum acuminatum*, *Acrotriche depressa*) methods of propagation. However, we have hardly scratched the surface of Australia's diverse native plant resources which are currently available for the development of a truly native cuisine. If the nation is to derive full commercial benefits it will need strong support from the Government and the participation of many other players.

As is the case in any new industry, we are confronted by a daunting array of important technical and market research topics. Through the pioneering work of ANPI and others, opportunities are being created within the industry. We are confident of delivering some much needed "good news" to Australia's horticultural, environmental, and farming sectors. There are numerous challenges for individu-

als and organisations to conduct further research necessary to develop the industry to its full potential.

Australia's wealth of floral resources points to a need to go beyond its taxonomic classification and cultivation for aesthetics. It should be noted, however, that whilst our research into an Australian cuisine offers exquisite flavours and wonderful perfumes, many of the targeted species are stunning ornamentals as well as being extremely practical in the kitchen.

The reality is that no matter how vigorously we attempt to avoid change, our Australian culture is being shaped by Australian ecosystems. However much we seek to modify and manipulate our environment, it will always dictate our future directions. If we wish to make a smooth change, it is essential that Australians evolve a culture that considers these factors and helps us to prosper long-term on our continent.

**Acknowledgements.** I wish to acknowledge the assistance of Mr. Andrew Beal (CEO, ANPI), and Ms. Jykomi Harrington in the preparation of this paper.

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## Propagation of the Olive in Italy and Australia

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#### INTRODUCTION

Man has propagated the olive (*Olea europaea* L.) since it was first cultivated 5000 years ago. Essentially, the various methods of propagation used have not changed. In the last few years there has been a worldwide revival of this ancient crop. This interest has prompted research to develop specific rootstocks and with the same characteristics deemed desirable in other fruit crop rootstocks, e.g., apple, citrus, and grape.

These rootstocks must be propagated asexually and have the following characteristics: (1) Easily propagated by cutting, (2) Resistant to soil-borne diseases and (3) Able to impart vigour (i.e., drought resistance) or reduce vigour (dwarfism) in the selected cultivar.

Rootstocks can be propagated by ordinary semi-hardwood cuttings in spring, summer, or autumn. The following spring these rooted cuttings can be grafted with the desired cultivar. An alternative is to use a "step-graft" (Editor's note: also known as cutting-graft technique). The principle behind this procedure is to graft the scion cultivar onto a cutting (the rootstock) and then strike this combination at the same time.